# Arkansas Science & Technology Authority

# Annual Report FY 1989

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# The Arkansas Science & Technology Authority

## Board of Directors

William H. Bowen
Chief Executive Officer and Chairman of the Board,
First Commercial Corporation
Little Rock, Arkansas
Term expires: 1992

Dr. Paul Marion
Director
Arkansas Department of Higher Education
Little Rock, Arkansas
Permanent appointment

Harry Truman Moore
Attorney
Goodwin, Hamilton & Moore
Paragould, Arkansas
Term expires: 1993
**Vice Chairman**

Dr. Joe F. Nix
Professor
Department of Chemistry
Ouachita Baptist University
Arkadelphia, Arkansas
Term expires: 1991
**Chairman**

Dr. Betty Overton
Dean of the Graduate School
University of Arkansas at Little Rock
Little Rock, Arkansas
Term expires: 1993

Dr. Donald O. Pederson
Vice Chancellor for Academic Affairs
University of Arkansas
Fayetteville, Arkansas
Term expires: 1990

Louis L. Ramsay, Jr.
Attorney
Ramsay, Cox, Uridgforth, Gilbert, Harrelson & Starling
Pine Bluff, Arkansas
Term expires: 1992

Dr. Winfred L. Thompson
President
University of Central Arkansas
Conway, Arkansas
Term expires: 1990

John Troutt
Publisher
Jonesboro Sun
Jonesboro, Arkansas
Term expires: 1992
**Secretary**

Jerry Webster
President
Webstor Corporation
Little Rock, Arkansas
Term expires: 1991

Dr. William Willingham
Professor
Natural Sciences Department
University of Arkansas at Pine Bluff
Term expires: 1993

Ex-Officio members:

The Honorable Max Howell
Arkansas State Senate
Jacksonville, Arkansas
Term expires: 1993

The Honorable John Lipton
Arkansas House of Representatives
Warren, Arkansas
Term expires: 1993

**Committees:**

Executive Committee
Dr. Joe Nix - Chairman
William Bowen
Harry Truman Moore
Dr. Winfred Thompson
John Troutt

Investment Committee
Harry Truman Moore - Chairman
William Bowen
Louis Ramsay, Jr.
Jerry Webster

Planning Committee
John Troutt- Chairman
Dr. Paul Marion
Dr. Winfred Thompson

Research Committee
Dr. William Willingham - Chairman
Dr. Donald Pederson
Dr. Betty Overton

**Bill Clinton**
**Governor**

**Dr. John W. Ahlen**
**ASTA President**

Dr. Joe Nix
Chairman

June 30, 1989

Governor Bill Clinton and
Members of the 77th General Assembly
State Capitol Building
Little Rock, Arkansas 72201

Dear Governor Clinton and Legislators:

I am pleased to present the 1989 Annual Report of the Arkansas Science & Technology Authority, which charts our progress in economic development.

As ASTA closes out the decade, we look at our past accomplishments and future goals as a springboard to the 21st century, with research and technology development leading the way. The success of the programs outlined in this report is indicative of the direction the Authority will continue to pursue.

The dividends are, in part, measured by the increasing number of proposals being submitted and an overall heightened awareness of the role of science and technology throughout the state.

The Basic and Applied Research Programs this year granted a total of $651,652.95 to scientists throughout the state, representing 25 projects, bringing the total grant expenditures since 1986 to $1.9 million. Counting leveraged private company funds awarded through the Applied Research Program, ASTA has pumped more than $988,338 into the state's economy this year, bringing the total actual state and private funds spent on research to more than $2.6 million since 1986. Experts in economic development have recognized that funding research is a difficult commitment to make, since the benefits are hard to project. But due to a commitment from the state to pursue research, we have begun to see payoffs from those early efforts.

The Seed Capital Investment Program, which this year alone has conditionally invested more than $430,000 to three companies, is thriving. The Business Incubator Program is nourishing six centers throughout the state, which provide assistance to 40 individual companies, with a total employment of 180.

With these premium benefits to the economy, we believe the Authority is directly on course with its mission: bringing the benefits of science and technology to the people of Arkansas. These kinds of tangible results are kindled from a commitment to research - an initiative which builds a stronger economy - providing an appropriate theme for our report. We are proud of our accomplishments and contributions to the people of Arkansas and eagerly seek our future challenges.

Sincerely,

Joe F. Nix

Dr. Joe Nix
Chairman of the Board
Arkansas Science & Technology Authority

# ASTA: A Brief History

*"Arkansas can carve out a unique place for itself in the nation if, in establishing its research and development goals, particular attention is given to the future needs of the country and how Arkansas can combine its own special resources and capabilities to arrive at innovative means of meeting those needs." (Report of the Legislative Council Task Force in accordance with Interim Resolution 81-67, Jan. 1983.)*

In 1983, the General Assembly created the Arkansas Science & Technology Authority through Act 859, following an insightful Legislative Council Task Force report outlining Arkansas' research strengths and the direction the state should take to capitalize on those strengths.

ASTA's mission: To bring the benefits of science and advanced technology to the people of Arkansas.

Research is the beginning and heart of all of the programs at ASTA, but it is only the first step in a well-planned series of events to stimulate Arkansas' economy.

Since 1983, the state has allocated $7.5 million, to support ASTA's three primary programs. Despite ASTA's modest funding, this independent state agency has been recognized as a national model for research and technology-based economic development.

In the **Research Programs**, both basic and applied grant research programs have funded innovative research at Arkansas colleges and universities. From the first research grant approved in 1986, through June 1989, more than $1.9 million in state research dollars have been granted to scientists throughout the state, representing 63 projects. Additionally, private industry matching grants to scientists have totalled $743,322.28 since 1986.

A primary part of the Research Programs' objective is the funding of original scientific research at the state's colleges and universities, with consideration given to those with economic potential.

Technology transfer is a part of the crucial development process encouraged by ASTA. With research providing the "nuts and bolts" or "secret formulas," businesses and industries then need to be prepared to use the technology.

This program networks with the economic development staffs within state colleges and universities and assists in linking educational resources with federal labs and private industries.

A constructive tool used in technology transfer was created in 1985, when the General Assembly authorized the Research and Development Tax Credit. The credits are available to industry sponsors of ASTA's approved applied research projects. Those eligible for tax credits can claim 33 percent of the value of their contribution, up to a maximum of 50 percent of their net tax liability. The credits are intended to stimulate private-sector support to universities and college research programs, thus motivating technology transfer and university/industry cooperation.

In another vein, ASTA promotes the federal Small Business Innovation Research Program, which competitively awards federal research and development (R&D) funds to small businesses conducting research important to major federal agencies. From business plans and feasibility studies to actual dollars, ASTA is supporting, monitoring and guiding science and technology developments in the state.

Six business incubator sites are located across the state, nuturing new technology-oriented companies through difficult start-up stages with a $2.09 million legislative commitment.

New ideas and scientific discoveries are crucial for home-grown long-term economic development, and that development requires capital.

The **Seed Capital Investment Program** provides risk capital to companies with technology-based products or processes. Over the past three years, ASTA has been directly involved in pumping $3.6 million into the economy through this program. Of that amount, $2.775 million in private dollars were invested after ASTA agreed to invest $855,000 in six companies.

The best way to map the future is to study the past. ASTA strives to do both through its **Information Program.** This program is a vehicle for providing information about ASTA's programs and digesting economic changes in the science and technology development forecast. Since 1985, this program has focused on mechanisms to bring more federal R&D dollars into Arkansas colleges and universities.

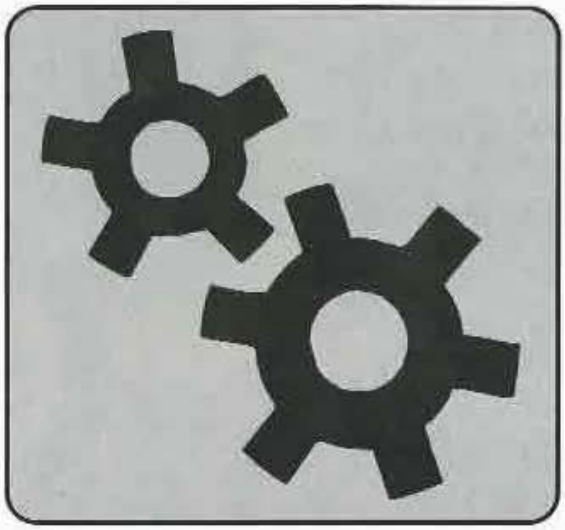
The Authority is governed by a 11-member board of directors appointed by the Governor to staggered four-year terms. Its 12-member staff is headed by the president.

# FY 1989 Highlights

**July 28-29 (1988):** Consultants addressed Little Rock and Pine Bluff community leaders on the potential for a National Biotechnology Cooperative in central Arkansas.

**September 8-9:** ASTA and representatives of the National Center for Toxicological Research participated in a strategic planning session for the National Biotechnology Cooperative with consultants in Columbus, Ohio.

**September 28:** A successful conference on the federal Small Business Innovation Research program was hosted by ASTA and UALR. Featured speaker was Ann Eskesen, president of Innovation Development Institute, the leading private sector authority on SBIR programs.



**September 28:** The Energy Committee of the Arkansas General Assembly awards $300,000 from the petroleum violation escrow fund to ASTA for energy-related research projects.

**October 12:** ASTA showcased the results of our programs in an exhibit for the Governor Bill Clinton's announcement of his 1989 legislative program.

**Jan. 4 (1989):** ASTA entered into a partnership with the Jefferson Foundation, Inc. for a preliminary assessment for planning a National Biotechnology Cooperative.

**Feb. 17:** A new steering committee for Arkansas' participation in the federal Experimental Program to Stimulate Competitive Research (EPSCoR) held its first meeting. As one of the original five EPSCoR states funded by the National Science Foundation, Arkansas has the opportunity to receive another $1.2 million over two years.

**April 19:** Dr. John W. Ahlen testified before a U.S. Senate Appropriations Subcommittee to urge support for FY1990 funding of the National Biotechnology Cooperative. Also, the "FDA Revitalization Act" is introduced in the U.S. Senate identifying the National Center for Toxicological Research (NCTR) as the suggested site for a national biotechnology demonstration project.

**May 7:** Dr. John W. Ahlen, selected to represent Arkansas, departs on an 11-day tour of three European countries to foster a technology exchange program with the United States.

**May 10-13:** ASTA participated in a national Astrophysics workshop held in Little Rock, which centered on discussions involving neutrinos and the possibility of locating a Gamma Ray and Neutrino Detector (GRANDE) in Arkansas. Governor Bill Clinton later pledged support of the project and $500,000, pending the U.S. Department of Energy's decision to build GRANDE in Arkansas.

**May 19:** The ASTA Board of Directors awards $250,000 under the Business Incubator Program to the University of Arkansas at Monticello, to fund their start-up proposal for an "Industrial Renaissance Center."

**June 27:** U.S. Sen. Dale Bumpers' office notified ASTA that the Food and Drug Administration had released $500,000 to begin a feasibility study and master plan for the National Biotechnology Cooperative.

# Seed Capital Investment Program:

The Seed Capital Investment Program had an active year, with ASTA's Board of Directors conditionally approving three investments in Arkansas home-grown companies. Combined, these investments total $430,000, while leveraging a total of $1.88 million in capital from private sources. All three companies project that 55 new jobs will be created over the next two years.

This increased pace for the Seed Capital Investment Program reflects on the track record established since the 1985 Arkansas General Assembly authorized and funded this innovative program. ASTA's investment in technology-based companies since 1986 totals $855,000, stimulating an additional $3.88 million from private investment sources.

Firms interested in tapping ASTA's investment fund must first submit a pre-application for review. Applicants must demonstrate that their product or service is sufficiently innovative to have a competitive advantage in the marketplace. Once eligibility is determined, business plans are requested from the firm and the due diligence process begins. During this process the staff determines the viability of the new technology and potential markets are identified.

All potential investments are reviewed by ASTA's Investment Committee and submitted to the Board of Directors for final action. Investment vehicles for approved applicants include royalty arrangements, patent-participation rights and debt financing. ASTA's enabling legislation concerning the Seed Capital Investment Program allows initial financing for companies unable to secure adequate financing from traditional sources, such as banks. By statute, ASTA has the ability to invest up to $500,000 in each project at any one time.

Once approved, ASTA's staff helps the new technology-oriented firms evaluate their business plans and assists in identifying additional sources of financing and information.

Although there are many facets to the Seed Capital Investment program, the creation and retention of technology-based jobs in Arkansas is one of the most important.

So far, 48 skilled jobs have been added to Arkansas' workforce through this program. Of these, 40 have been created by Arkansas Technologies, Inc. (ARTECH), an automation and robotics firm located in Clarksville that makes products to streamline assembly-type production.

ARTECH reflects the type of technology-based, Arkansas-grown business ASTA proudly supports - ARTECH was initially funded by ASTA in 1986 as a start-up company with only three employees. Nthography Inc. (8 employees) and the Micoil Corporation were among the first investments made from the program. Although Micoil is no longer in operation, it represents the high-level of risk associated with financing start-up companies. These types of heavily-researched decisions reflect a part of the genuine commitment Arkansas is willing to make to give new science and technology companies a chance to grow in Arkansas.

The 1989 conditionally-approved companies that are described below also offer growth and expansion potential in the state.

## Emerging Technologies, Inc.

Emerging Technologies, Inc. is a Little Rock company that has developed the world's smallest laser sighting device and is launching into the visual laser market.

The company employs advanced laser technology in sporting goods equipment, marketed as Laser Aim products. The Graduate Institute of Technology, located at the University of Arkansas at Little Rock, assisted in developing and designing the miniature power supply.

ASTA commitment: $200,000
Other sources: $1.05 million
Potential Jobs: 20-30 during start-up

# A Real Commitment to PROGRE$$

## N-Cor Technologies, Inc.

N-Cor Technologies, Inc., of El Dorado, has developed a process to facilitate safer removal of asbestos. In contrast to the current technology for asbestos abatement, which requires some manual handling and storage of the cancer-causing agent, N-Cor's process allows a more efficient, safer containment of asbestos material.

N-Cor's technology incorporates automated vacuum techniques to remove the asbestos. The material is transformed into a slurry mix for subsequent burial in concrete form in a landfill or other storage-containment area.

ASTA commitment: $200,000
Other sources: $375,000
Potential Jobs: 20 new jobs over 5 years

## Electromap, Inc.

Electromap, Inc., of Fayetteville, has developed and is now marketing a user-friendly, menu-driven computerized electronic atlas of the world. Their conditionally approved ASTA investment is $30,000. The company hopes to bring the classroom into the computer age by providing information such as population, geographical and government data by simply pushing a button.

It is a reference tool designed for use by students, schools, libraries, businesses and community and economic development organizations.

With 238 full-color county, regional, world, topographic and statistical maps, it has been described as the "highest quality electronic atlas on the market today." The product was developed in cooperation with the University of Arkansas at Fayetteville.

ASTA commitment: $30,000
Other sources: $25,200
Potential Jobs: 3-5 during start-up

# A National Biotechnology Cooperative:

*"Due to the enormous resources being dedicated [to biotechnology] by foreign countries ... [there] is a need for a facility to be developed in the United States where ... organizations ... can come together to share that space and the sophisticated scientific equipment required of this work...*

*The [U.S. Senate Labor and Human Resources] Committee has been informed that such a facility already exists. The government owns approximately 400,000 square feet of this high-level containment. The Committee understands that it is part of a very active and highly respected biological research facility in central Arkansas, the National Center for Toxicological Research, NCTR ..." (Senate Report 100-600 issued by the Labor and Human Resources Committee of the U.S. Senate on October 21, 1988)*

In the March 1989 issue of BioPharm, Steve Burrill of Ernst & Young states: "The federal government has become concerned that it is perceived as a barrier to biotechnological progress; to change this perception, it has taken several steps to support the domestic biotechnology industry. In particular, FDA has publicized its intentions to focus on assisting biotechnology companies. . ."

FDA's approach involves the use of its National Center for Toxicological Research, an internationally recognized laboratory whose sole mission is research–with no regulatory responsibilities. In complying with the requirements of the Federal Technology Transfer Act of 1986, FDA has authorized NCTR to enter into cooperative research and development agreements with industry, with the intent of moving valuable, federally-funded research into the marketplace.

NCTR's multi-disciplinary research programs focused on risk assessment, its well-equipped laboratories, 400,000 sq.ft. of high-containment space, and the support of the University of Arkansas and the NCTR Associated Universities, combine to offer a unique opportunity to nurture commercial biotechnology research and development in central Arkansas.

In the fall of 1989, the Arkansas Science & Technology Authority prepared to conduct a feasibility study and master plan for a National Biotechnology Cooperative (NBC) to be located at NCTR. The

*The National Center for Toxicological Research (background) is uniquely equipped to house a national biotechnology demonstration project. The facility has over 400,000 sq. ft. of high-level containment space.*

*NCTR's multi-disciplinary research programs focused on risk assessment can serve as a foundation to the growth of the biotechnology industry.*

# Planning for the Future

feasibility study will asses the need for such a national biotechnology demonstration project and result in a well-developed concept for the NBC. The master plan will detail facilities and equipment requirements.

U.S. Senator Dale Bumpers, a long-time advocate of the project, has pushed for funding through FDA appropriations since March 1988.

Together with U.S. Food and Drug Administration Commissioner Frank Young (who included this project in the FDA's Plan of Action III), U.S. Sen. Orrin Hatch (R-Utah) and others, Senator Bumpers has work to increase the international competitiveness of the U.S. biotechnology industry.

The National Biotechnology Cooperative would be the first demonstration project of its kind with a national agenda and scope.

By taking advantage of the available high-containment laboratory space along with research support services and equipment, new biotech firms could substantially reduce their early-stage operating costs.

Established firms could leverage their research dollars through on-site cooperative R&D agreements. Adding to this foundation the cooperation and coordination of the federal regulatory agencies could result in more efficient commercialization of new products with benefits to consumers around the world.

The objective of this demonstration project is to overcome identified barriers to the commercialization of biotechnology products.

In effect, the larger project may be seen as a composite of smaller efforts, each directed toward barriers identified by the U.S. Congress Office of Technology Assessment.

## Defined barriers to commercialization of biotechnology products


The effort envisions the utilization of the facility and other resources to develop innovative approaches to address each of these barriers. Expertise would be drawn heavily from academia, industry, state and local governments, and several agencies of the federal government.

It is anticipated that the feasibility study and master plan for the National Biotechnology Cooperative will get underway in October 1989.

# The Cotton Club

## Arkansas researchers harvest answers

An increased need to profitably produce cotton has enhanced Arkansas' position in the global cotton marketplace, thanks to stepped-up research focused on cotton-production technology.

Arkansas' lead in cotton research began early in the decade and was boosted in 1987 when Arkansas farmers produced their biggest cotton crop in 10 years. The harvest captured the attention of the nation as the second-largest yields of record - 786 pounds of cotton per acre - were recorded.

According to figures released by the University of Arkansas' Agri-Economic and Rural Sociology Department, soybeans and rice are listed as the top cash crops in the state and cotton holds a respectable third place listing. More than 1.04 million cotton bales, averaging 480-pounds per bale, were produced in the state in 1988.

ASTA has funded three research grants that sweep the gamut of problems and innovative solutions concerning profitable, scientific cotton production.

Dr. Derrick Oosterhuis, a Division of Agriculture plant physiologist at the University of Arkansas, Fayetteville, concentrates his research on the nutritional needs and habitat requirements of cotton plants.

Early results from Oosterhuis' research show the carbohydrate or "food" needs of the cotton plant begin to decline before the cotton fully matures.

Oosterhuis' applied research grant, funded with a $20,082 ASTA grant, matched by the Altheimer Foundation, is aimed at management of "late-season cotton."

In currently accepted practices, farmers apply a variety of chemicals - including nitrogen - and irrigate the plant during all phases of growth up until a few days before harvesting. Oosterhuis' research is aimed at pinpointing the exact requirements of the plant, which could save farmers time and money spent on fertilizing, irrigation and pesticides late in the growing cycle.

The university's agri-economic statistics show estimated economic benefits from this type of management could boost cotton returns by $42 per acre, bringing in an additional $27 million each year. The cotton lint brings in an estimated $250 million annually and can claim credit for indirect economic benefits valued at more than $1.08 billion in 1987, according to university calculations.

"If we can take away just one of those last-minute applications, you're talking about saving millions of dollars around the state," he said.

In Kelso (Desha County), Dr. Scott McConnell is thinking along the same lines.

McConnell, a researcher at the Southeast Research and Extension Center, is working on evaluating the increased production value of applying one company's product to cotton.

McConnell's research, funded by a $10,052 ASTA grant matched by BASF Wyandotte Corp., is designed to evaluate the nutritional value of adding chemical treatments directly to the leaves (foliar feeding).

While all research is important and is vital to continued success, favorable results cannot be guaranteed.

In McConnell's case, the product he is studying, PIX, did not achieve the harvest-boosting success both BASF and McConnell had hoped.

According to McConnell's data, the majority of which was collected since 1988, PIX has not drastically increased the cotton plant's ability to "make a better plant."

"It doesn't always turn out the way you want it to," McConnell said. However, his research should prove valuable to BASF in future product marketing and product evaluation.

While McConnell and Oosterhuis struggle with making the best of available resources, another UAF scientist is working on how to make a better cotton plant.

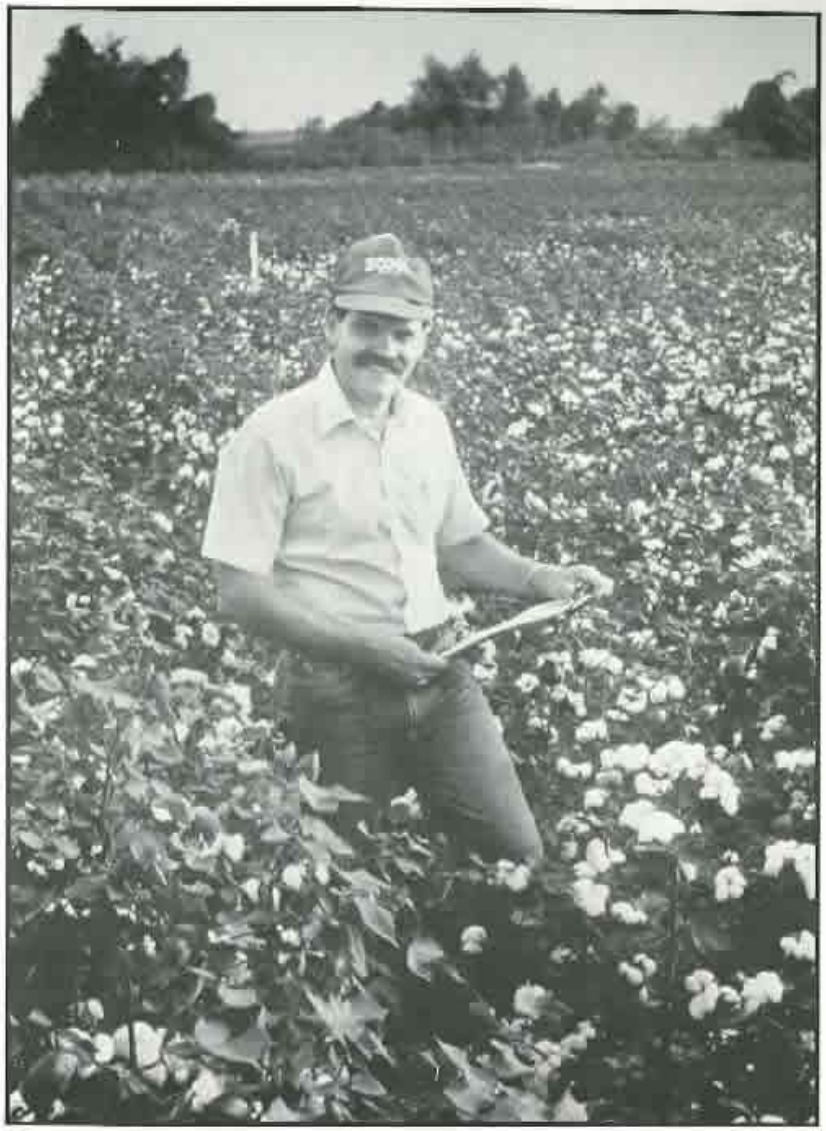
Dr. James McDonald Stewart is studying a complicated gene theory and experimenting with hybrids to create a cotton plant that will grow faster and will produce more predictable harvests.

Stewart's research, performed at UAF, is complex and involves retracing a cotton's genetic line, using painstaking cross-breeding processes that often take several growing seasons to evaluate.

Generally speaking, Stewart is trying to make the plant itself more efficient, by genetically telling the plant to take on more carbon dioxide, needed to produce nutrients, and process it quicker. While Stewart's research and subsequent applications may only slightly change the plant's ability to take on carbon dioxide, small changes could make a big difference.

Early results are slow and unpredictable.

"There is an off chance that you'll find what you're looking for the first time around, but it's unlikely," Stewart said. "You just keep trying. That's what research is all about."



## Reaping Results

*Dr. Derrick Oosterhuis, (top right) rates the percentage of boll openings as part of the September 1988 end-of-season crops at the Altheimer fields near Pine Bluff. (UAF Courtsey Photo)*

*A completely computerized, portable machine, which measures photosynthesis (bottom left)helps cotton researchers further study growth mechanics. (UAF Courtsey Photo)*

*In Kelso, at the Southeast Branch Experiment Station, Research Specialist Steve Frizzell (bottom right) applies a "top dressing" of nitrogen to cotton plants. (Staff Photo)*